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GROUP 2800

Application Number: 09/765,754
Filing Date: January 19, 2001
Appellant(s): CHUNG ET AL.

Joseph B. Ryan
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 5/23/2005.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Prior Art of Record

5,323,424	FAZEL et al.	6-1994
5,416,801	CHOULY et al.	5-1995
5,566,193	CLOONAN	10-1996

5,841,378	KLAYMAN et al.	11-1998
5,970,098	HERZBERG	10-1999

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-4, 6-8, 17, 19, 23 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter).

Regarding claim 1, Fazel teaches a method for multilevel coding of a stream of information bits in a communication system, the method comprising the steps of

separating the stream of information bits into a plurality of different portions (30 in Fig. 3);

associating each of the portions of the information bits with one of a plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_m-e_m in Fig. 3);

applying at least one code (31_1, 31_2, ..., 31_M in Fig. 3) to the portion of the information bits of each level in a designated subset of the plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_M-E_M-e_M in Fig. 3), such that the portions of the information bits for one or more levels in the designated subset are coded while the portions of the information bits

for one or more levels not in the designated subset (D_{M+1}-e_{M+1}, ..., D_m-e_m in Fig. 3) are uncoded;

utilizing both the coded portions of the information bits and the uncoded portions of the information bits to select modulation symbols for transmission in the system (32 in Fig. 3, col. 7, lines 29-33).

Wherein the stream of information bits comprises at least one frame of information bits, and each of the portions of the stream of information bits comprises a different class of bits within the at least one frame, each class of bits comprising a plurality of contiguous bits of the frame, and wherein each of the portions of the stream of information bits comprises a corresponding one of different classes of bits within the at least one frame (D_1, D_2, ... D_m in Fig. 3; col. 6, lines 47-55; col. 7, lines 24-29 and 34-44; also note that the information bits are HDTV signal samples which are known to be transmitted in frames, see col. 5, line 39), and wherein the at least one code is selected so as to provide different amounts of error protection for at least a subset of the different classes of bits (col. 6, lines 40-55, col. 7, lines 22-23; also notes that each encoder E_i has a different minimum Hamming distance δ_i, which provides a different amount of error protection).

Regarding claim 2, the stream of information bits comprises a stream of source-coded information bits (11 in Fig. 1).

Regarding claim 3, there are a total of m of the levels, and the modulation symbols are selected from a signal set of a 2^m modulation constellation (col. 7, lines 29-33).

Regarding claim 4, the at least one code comprises a block code (col. 6, line 63).

Regarding claim 6, the at least one code comprises a cyclic redundancy check (CRC) code (col. 7, line 36)

Regarding claim 7, there are a total of m of the levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_m-e_m in Fig. 3), arranged from a lowest level to a highest level, and the designated subset of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_M-E_M-e_M in Fig. 3) includes at least the lowest level (D_1-E_1-e_1 in Fig. 3).

Regarding claim 8, the method of claim 1 wherein there are a total of m of the levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_m-e_m in Fig. 3), arranged from a lowest level to a highest level, and the designated subset includes a series of i_{max} adjacent levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_M-E_M-e_M in Fig. 3) beginning with the lowest level, where i_{max} is less than m (as shown in Fig. 3, $M < m$).

Regarding claim 17, Fazel teaches a method for multilevel coding of a stream of information bits in a communication system, the method comprising the steps of

separating the stream of information bits into a plurality of different portions (30 in Fig. 3);

associating each of the portions of the information bits with one of a plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_m-e_m in Fig. 3);

applying at least one code (31_1, 31_2, ..., 31_M in Fig. 3) to the portion of the information bits of each level in a designated subset of the plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ... D_M-E_M-e_M in Fig. 3), such that the portions of the information bits for one or more levels in the designated subset are coded while the portions of the information bits

for one or more levels not in the designated subset (D_{M+1}-e_{M+1}, ..., D_m-e_m in Fig. 3) are uncoded;

utilizing both the coded portions of the information bits and the uncoded portions of the information bits to select modulation symbols for transmission in the system (32 in Fig. 3, col. 7, lines 29-33),

wherein the stream of information bits comprises a plurality of frames of information bits (the information bits are HDTV signal samples which are known to be transmitted in frames, see col. 5, line 39), and each of the portions of the stream of information bits comprises at least a part of a particular one of the frames, the part comprising a plurality of contiguous bits of the corresponding frame (D_1, D_2, ... D_M, D_{M+1}, ..., D_m in Fig. 3; col. 6, lines 47-54; col. 7, lines 24-29 and 34-44; note that D_i are output from a S/P converter, each of D_i therefore comprises a plurality of contiguous bits).

Regarding claim 19, Fazel further teaches the step of decoding received versions of the selected modulation symbols in a multilevel decoder (lines 1-4 of the abstract).

Regarding claim 23, Fazel teaches an apparatus for multilevel coding of a stream of information bits in a communication system, the apparatus comprising:

an multilevel encoder (Fig. 3) receiving a stream of information bits separated into a plurality of different portions (30 in Fig. 3), each of the portions of the information bits being associated with one of a plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_m-e_m in Fig. 3), the encoder being operative to apply at least one code (31_1, 31_2, ..., 31_M in Fig. 3) to the portion of the information bits of each level in a designated subset of the

plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_M-E_M-e_M in Fig. 3), such that the portions of the information bits for one or more levels in the designated subset are coded while the portions of the information bits for one or more levels not in the designated subset (D_{M+1}-e_{M+1}, ..., D_m-e_m in Fig. 3) are uncoded; and

a modulator (32 in Fig. 3, col. 7, lines 29-33) having an input coupled to an output of the multilevel encoder, the modulator utilizing both the coded portions of the information bits and the uncoded portions of the information bits to select modulation symbols for transmission in the system,

Wherein the stream of information bits comprises at least one frame of information bits separated into a plurality classes of bits, each class of bits comprising a plurality of contiguous bits of the frame, and wherein each of the portions of the stream of information bits comprises a corresponding one of the different class of bits within the at least one frame (D_1, D_2, ... D_m in Fig. 3; col. 6, lines 47-55; col. 7, lines 24-29 and 34-44; also note that the information bits are HDTV signal samples which are known to be transmitted in frames, see col. 5, line 39), and wherein the at least one code is selected so as to provide different amounts of error protection for at least a subset of the different classes of bits (col. 6, lines 40-55, col. 7, lines 22-23; also notes that each encoder E_i has a different minimum Hamming distance δ_i, which provides a different amount of error protection).

Regarding claim 25, Fazel teaches a method for decoding of a multilevel coded stream of information bits in a communication system, the multilevel coded stream of information bits being coded by separating the stream of information bits into a plurality

of different portions (30 in Fig. 3), associating each of the portions of the information bits with one of a plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_m-e_m in Fig. 3), and applying at least one code (31_1, 31_2, ..., 31_M in Fig. 3) to the portion of the information bits of each level in a designated subset of the plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_M-E_M-e_M in Fig. 3), such that the portions of the information bits for one or more levels in the designated subset are coded while the portions of the information bits for one or more levels not in the designated subset (D_{M+1}-e_{M+1}, ..., D_m-e_m in Fig. 3) are uncoded, the method comprising the steps of:

demodulating (113 in Fig. 1B) received versions of the modulation symbols to obtain outputs corresponding to each of the plurality of levels; and

decoding (112 in Fig. 1B) each of the outputs associated with a given level in the designated subset so as to obtain a received version of the corresponding portion of the information bits,

Wherein the stream of information bits comprises at least one frame of information bits, and each of the portions of the stream of information bits comprises a different class of bits within the at least one frame, each class of bits comprising a plurality of contiguous bits of the frame, and wherein each of the portions of the stream of information bits comprises a corresponding one of different classes of bits within the at least one frame (D_1, D_2, ... D_m in Fig. 3; col. 6, lines 47-55; col. 7, lines 24-29 and 34-44; also note that the information bits are HDTV signal samples which are known to be transmitted in frames, see col. 5, line 39), and wherein the at least one code is selected so as to provide different amounts of error protection for at least a subset of the different

classes of bits (col. 6, lines 40-55, col. 7, lines 22-23; also notes that each encoder E_i has a different minimum Hamming distance δ_i, which provides a different amount of error protection).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 5 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter) in view of Herzberg (U.S. Patent No. 5,970,098) and Klayman et al. (U.S. Patent No. 5,841,378, "Klayman" hereinafter).

Regarding claim 5, Fazel teaches the claimed limitation (see the rationale applied to claim 1 above), but does not teach that at least one of the encoder 31_1-31_M comprises a block coder concatenated with a convolutional coder. However, Herzberg teaches multilevel code may be made up of convolutional codes, block codes, or a combination of both (col. 4, lines 45-46). Klayman teaches a block code concatenated with a convolutional code will provide a better error correcting power (col. 2, lines 32-37). Since some bits in Fazel need more error correcting power than the others (col. 7, lines 22-23), it would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace at least one of the block encoders 31_1-31_M with

a concatenated encoder, as taught by Herzberg and Klayman, so as to provide a better error protection.

Regarding claim 15, as applied above in claim 5, since at least one block encoders is replaced, the number of the concatenated encoders J_{max} inherently satisfies the relationship: $1 \leq J_{max} \leq i_{max.}$

5. Claims 9-13 and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter).

Regarding claim 9-13, Fazel teaches the claimed limitation (see the rationale applied to claims 1 and 8 above), but does not specify the values of m and M (i.e., i_{max}). However, the values of m and M clearly are just a matter of design choices. The value of m is merely dependent on the type of modulation selected (e.g., 16-QAM, 32QAM etc., note that Fazel also teaches QAM, see col.4, line 24). The value of M merely depends on the number of bits that need to be coded for protection against noise. The values of m and M are therefore are design choices depends on the system constraint and requirement, and will not change the operation and principle of the method of multilevel coding taught by Fazel. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to select any value for m (such as 4 or 5) and M (such as 2, 3, or 4) to meet the requirement of the system. The applicants at most discover the optimum ranges of m and M for certain applications. However, it is not inventive to discover optimum or workable ranges. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves routine skill in the art. See *In re Aller, 105 USPQ 233.*

Regarding claims 20-22, Fazel teaches the claimed limitation (see the rationale applied to claim 1 above) including each of encoders 31_1-31_M has a code rate of $R_i = k_i/n_i$ (col. 6, lines 52), but does not specify the values of m, each code rate Ri or the overall code rate. With respect to the value of m, the value of m is merely dependent on the type of modulation selected (e.g., 16-QAM, 32QAM etc., note that Fazel also teaches QAM, see col.4, line 24). The value of m is therefore a design option that depends on the system constraint and requirement, and will not change the operation and principle of the method of multilevel coding taught by Fazel. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to select any value for m (such as 4 or 5) to meet the requirement of the system or application. Further, with respect to the code rate, the code rate is merely dependent on the parity or redundant bits that are added to the information bits to achieve a desired error correcting or protection performance, which is just a matter of design choice. The value of R_i will not change the operation and principle of the method of multilevel coding taught by Fazel. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to select any value for R_i such as the claimed values to achieve the desired error correcting or protection performance. The applicants at most discover the optimum ranges of m and Ri for a particular application. However, it is not inventive to discover optimum or workable ranges. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves routine skill in the art. See *In re Aller, 105 USPQ 233.*

6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter) in view of Cloonan (U.S. Patent No. 5,566,193).

Fazel teaches the claimed limitation (see the rationale applied to claim 1 above), but does not specifically teach that the encoder 31_1-31_M are arranged to have increasing code rates from the encoder 31_1 to the encoder 31_M.

Cloonan teaches that a higher error detection rates requires more parity bits (col. 12, lines 24-25).

Fazel teaches that the bit e_1 is most in need of protection, then e_2, etc. (see col. 7, lines 22-23) and each of the encoder E_1 (31_1 in Fig. 3) through E_M (31_M in Fig. 3) has the same length n (col. 6, line 62). It is clear E_1 has more parity bits ($n- k_1$) than E_2 ($n-k_2$), and E_2 has more parity bits than E_3 ($n-k_3$), etc. That is, $n-k_1 > n-k_2 > \ldots > n-k_M$, which in turn renders $k_1 < k_2 < \ldots < k_M$. Therefore, the relationship of the code rates is $k_1/n < k_2/n < \ldots < k_M/n$. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that the encoder 31_1-31_M should be arranged to have increasing code rates from the encoder 31_1 to the encoder 31_M, so as to provide the highest protection for the bit e_1, then e_2, etc.

7. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fazel et al. (U.S. Patent No. 5,323,424, "Fazel" hereinafter) in view of Chouly et al. (U.S. Patent No. 5,416,801, "Chouly" hereinafter).

Fazel teaches a method for multilevel coding of a stream of information bits in a communication system, the stream of information bits being separated into a plurality of

different portions (30 in Fig. 3), each of the portions of the information bits being associated with one of a plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_m-e_m in Fig. 3), wherein the method comprises the steps of:

applying at least one code (31_1, 31_2, ..., 31M in Fig. 3) to the portion of the information bits of each level in a designated subset of the plurality of levels (D_1-E_1-e_1, D_2-E_2-e_2, ..., D_M-E_M-e_M in Fig. 3), such that the portions of the information bits for one or more levels in the designated subset are coded while the portions of the information bits for one or more levels not in the designated subset (D_{M+1}-e_{M+1}, ..., D_m-e_m in Fig. 3) are uncoded;

utilizing both the coded portions of the information bits and the uncoded portions of the information bits to select modulation symbols (32 in Fig. 3, col. 7, lines 29-33) for transmission in the system,

Wherein the stream of information bits comprises at least one frame of information bits, and each of the portions of the stream of information bits comprises a different class of bits within the at least one frame, each class of bits comprising a plurality of contiguous bits of the frame, and wherein each of the portions of the stream of information bits comprises a corresponding one of different classes of bits within the at least one frame (D_1, D_2, ... D_m in Fig. 3; col. 6, lines 47-55; col. 7, lines 24-29 and 34-44; also note that the information bits are HDTV signal samples which are known to be transmitted in frames, see col. 5, line 39), and wherein the at least one code is selected so as to provide different amounts of error protection for at least a subset of the different classes of bits (col. 6, lines 40-55, col. 7, lines 22-23; also notes that each encoder E_i

has a different minimum Hamming distance δ_i, which provides a different error protection).

Fazel does not particularly teach the steps are implemented in software. However, the use of software to implement a coding scheme for the advantage of flexibility is well known in the art. Chouly teaches program (col. 4, lines 22-30) a multilevel coding system (Figs. 1A and 1B, notice the similarity between Fig. 1 of Chouly and Fig. 1 of Fazel). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to implement the method of Fazel in software, so as to provide the flexibility of changing system parameters for various applications.

(10) Response to Argument

A. With respect to claims 1-4, 6-8, 19, 23 and 25

The applicants group claims 1-4, 6-8, 19, 23 and 25 together and limit the argument on claim 1 only. In particular, the applicant argues *that none of the various outputs of the converter 30 in Fig. 3 of Fazel will comprise a plurality of contiguous bits of the given frame of stream 34. The m outputs of the m-bit serial-to-parallel converter 30 will receive respective ones of the m bits of each m-bit block of the given input frame, and no contiguous bits of the input frames. By way of illustration, output 1 of the converter 30 will receive bit 1, bit m+1, bit 2m+1, and so on, and none of which are contiguous bits of any frame of stream 34.*

Response --- Fazel never teaches that the serial-to-parallel (S/P) converter is an m-bit converter. Instead, Fazel teaches an m-class or m-group S/P converter. Fazel

teaches a serial-to-parallel converter 30 that transforms the serial data with data rate D into **parallel data** with rates D_1, D_2, ..., D_m. The M first binary streams are encoded by the encoders 31_1, 31_2, ..., 31_M which supply the binary coded data e_1, e_2, ..., e_M (see col. 7, lines 23-28, emphasis added). In order to transform the serial data with data rate D into parallel data with rates D_1, D_2, ..., D_m, the parallel bits output from the S/P converter must be grouped into m classes or groups. For example, the first k_1 bits of the parallel bits output by the S/P converter are grouped to form a rate of D_1 and sent to the first encoder 31_1. The first encoder provides the k_1 bits a first amount of error protection. The next k_2 bits of the parallel bits output by the S/P converter are grouped to form a rate of D_2 and sent to the second encoder 31_2. The second encoder provides the k_2 bits a second amount of error protection. The next k_3 bits of the parallel bits output by the S/P converter are grouped to form a rate of D_3 and sent to the third encoder 31_3. The third encoder provides the k_3 bits a third amount of error protection, and so forth. This is evidenced by the example given by Fazel in col. 7, lines 34-50. In the example, the <u>k_1 information bits</u> are encoded by a first encoder E_1 which has as its generating polynomial $g_1(x)$, for a minimum Hamming distance $\delta_1=10$. The <u>other k_2 information bits</u> are coded by a second encoder E_2 which has as its generating polynomial $g_2(x)$, for a minimum Hamming distance $\delta_2=4$. The <u>k_3 last bits</u> are coded by a third encoder E_3 which has as its generating polynomial $g_3(x)$, for a minimum Hamming distance $\delta_3=2$. Therefore, the outputs of the converter 30 in Fig. 3 of Fazel clearly comprise a plurality of contiguous bits of the given frame of stream 34. On the other hand, the applicant argues that the each output of the S/P converter 30 only

generates one bit at a time. That is, each of the encoders E_i only receives one bit at a time. According to such argument, the serial data with data rate D can only be transformed into parallel data with equal rates D/m, D/m, ..., D/m because the parallel bits are evenly distributed (one bit each). As a result, the S/P converter clearly cannot be operated as taught by Fazel because Fazel requires parallel data with different rates. Furthermore, according to the argument, the S/P converter 30 can only generate three parallel bits in the particular example given by Fazel in col. 7, lines 34-50, but cannot generate $k_1+k_2+k_3$ parallel bits required by the particular example. Therefore, the applicant's argument is deemed to be incorrect.

Beginning on the last paragraph of page 6 of the brief, the applicants further argue that *each output of converter 30 comprises multiple bits, but none of the multiple bits at a given output are contiguous bits of the input frame. As noted above, the multiple bits of output 1 of converter 30 are bit 1, bit m+1, bit 2m+1, and so on, none of which are contiguous bits of any frame of the input stream 34.*

Response --- Each output of the S/P converter as argued may be able to generate multiple bits, but still cannot generate multiple parallel bits. According to the argument, the S/P converter can only generate m bits of parallel data at a time. Therefore, bit 1, bit m+1, and bit 2m+1, for example, are clearly not parallel data. As a result, each encoder E_i can only receive one bit of parallel data (with <u>equal</u> rate D/m) if the S/P converter 30 is operated as argued by the applicant. On the other hand, each encoder E_i of Fazel receives parallel data with rate D_i from a corresponding output of the S/P converter 30. Therefore, the S/P converter of Fazel clearly is not operated as

argued by the applicant. Furthermore, if we apply the S/P converter as argued into the particular example given by Fazel in col. 7, lines 34-50 and tentatively ignore the requirement of encoding parallel data for each encoder, the third encoder E3, for example, would encode bits 3, 6, 9, ..., and so on. Bits 3, 6, 9, ... are clearly not the <u>k_3 last bits</u> (col. 7, line 44) required by Fazel. Therefore, the argument is not persuasive.

B. With respect to claim 17

The applicants make the same argument as the argument applied to claim 1. Therefore, the same response applied to the argument with respect to claim 1 above is also applied here.

C. With respect to claims 5 and 15

The applicants make the same argument as the argument applied to claim 1. Therefore, the same response applied to the argument with respect to claim 1 above is also applied here.

D. With respect to claims 9-13 and 20

The applicants make the same argument as the argument applied to claim 1. Therefore, the same response applied to the argument with respect to claim 1 above is also applied here.

E. With respect to claims 21 and 22

The applicants argue that the claimed arrangement is not a matter of design choice. *Applicants alone have determined that the particular five-level coding arrangement set forth in claim 21 or the particular four-level coding arrangement set forth in claim 22 may be advantageous in certain applications, such as those involving*

IBOC-DAB systems. There is no teaching or suggestion whatsoever in Fazel regarding this particular level and coding arrangement, nor is there any indication that such an arrangement may be more advantageous than another arrangement.

Response --- As explained above in the grounds of rejection, Fazel discloses the claimed method for multilevel coding of information bits. Fazel also discloses that the total level is m, the total number of encoded level is M, and each encoder has a respective code rate R_i (see Fig. 3, col. 6, lines 47-55). Therefore, Fazel discloses the general conditions for the claimed multilevel coding method. As explained by the examiner in the grounds of rejection, the value of m is merely dependent on the type of modulation to be used (e.g., 16-QAM, 32QAM, etc., note that Fazel also teaches QAM, see col.4, line 24). The value of M is merely dependent on the number of levels to be coded for protection against noise. The code rate R_i is merely dependent on the parity or redundant bits that are added to the information bits to achieve a desired error correcting or protection performance. The ranges of the values of m, M and R_i will not change the operation and principle of the multilevel coding method of Fazel, nor will improve the method. The selection or arrangement of the values of m, M and R_i merely depends on the system or application requirement. Further, as admitted by the applicants, the claimed arranged is <u>determined</u> because is only advantageous for <u>certain applications</u>, such as those involving IBOC-DAB systems (the examiner notes that IBOC-DAB is not recited in the claim). Therefore, the claimed arrangement is clearly only a matter of design option, which is dictated by system or application requirement. The applicants at most discover the optimum ranges of m and Ri for a

particular application. However, it is not inventive to discover optimum or workable ranges. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves routine skill in the art. See *In re Aller, 105 USPQ 233.*

F. With respect to claim 14

The applicants make the same argument as the argument applied to claim 1. Therefore, the same response applied to the argument with respect to claim 1 above is also applied here.

G. With respect to claim 24

The applicants make the same argument as the argument applied to claim 1. Therefore, the same response applied to the argument with respect to claim 1 above is also applied here.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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Primary Examiner
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cmf
August 5, 2005

Conferees

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